DETAILED ACTION

Claim Objections

1. Claims 15 and 16 are objected to because of the following informalities: These claims include phrase "to any of the claim 3". Appropriate correction is required.

Information Disclosure Statement

In the IDS submitted, 6/29/2008, the Galpin et al. paper cited was not considered because the NPL copy submitted is the draft version and does not correspond to the one cited (the journal version). However, the examiner, has attached a copy of the journal version to the form PTO-892 in this office action.

Drawings

2. Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-21 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim(s) 1-16 and 21 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing (Reference the May 15, 2008 memorandum issued by Deputy Commissioner for Patent Examining Policy, John J. Love, titled "Clarification of 'Processes' under 35 U.S.C. 101"). The instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

Claim 17 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter, electro-magnetic signals. Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in § 101.

Claims 18-20 are directed to non-statutory subject matter. That is, the claims are directed to a device, where the body of the claim contains components which are all software based. For one example, the “means for building” and “means for representing” in claim 19 is computer software code implemented. The claimed components are software or program codes which are essentially a data structure, per se. Data structures are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-8, 10-13, and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Galpin (NPL Doc, "Sliding Adjustment for 3D Video Representation") in view of Praun et al. (US Pub 2002/0143419).

As per claim 1, Galpin teaches the claimed:

1. Method for representing a sequence of pictures grouped in sets of at least two successive pictures, called GOPs *(in figure 1, where "GOP 0" is a group of sequence of pictures (shown in the top of the figure))*, a textured, meshed three-dimensional model being associated with each of said GOPs *(in figure 1, the meshed 3D model is shown as "Model 0". In the figure, "Keyframe 0" shows the model textured)*, the method comprising:

representing the three-dimensional model associated with the GOP of level n *(in figure 1, where "GOP 0" is a GOP of level n; in the figure the three-dimensional model is labeled as "Model 0").*

Galpin does not explicitly teach the remaining claim limitations.

Praun teaches the claimed:

an irregular mesh taking account of at least one vertex of at least the irregular mesh representing the three-dimensional model associated with the GOP of level n-1, said vertex being called common vertex *([0011], "generating consistent parameterizations for a set of meshes, e.g., <u>irregular connectivity meshes</u> representing surfaces of arbitrary topology" and in figure 2 where a model is shown. In this case in figure 2, model 102-1, 102-2, and 102-3 each have common vertices associated with each model. Also see [0029], "The resulting consistent parameterizations give immediate point correspondences between the meshes and allow the meshes to be remeshed with the same connectivity, i.e., to be remeshed such that <u>every vertex in one remesh has a unique corresponding vertex in every other remesh</u>". In figure 2, one version of the, i.e. model 102-1 is representative of a person in a group of frames).*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Galpin with Praun. Praun teaches one advantage of the combination *([0012], "By providing consistent parameterizations for a set of meshes, the invention greatly facilitates mesh processing operations in a wide variety of DGP applications, including, for example, principle mesh components analysis, transfer of textures or wavelet details between meshes, and shape blending")*. Galpin can be modified by Praun by incorporating the consistent parameterizations for a set of meshes of Praun (as shown in figure 2) into the 3D models and their meshes in figure 1 of Galpin. For example, Praun can be used to find consistent parameterizations between the teapot models in figure 1 of Galpin.

As per claim 2, Galpin does not explicitly teach the claimed limitations.

Praun teaches the claimed:

2. Method for representing according to claim 1, wherein at least two consecutive three-dimensional models also have, associated with them, a basic model, built from said vertices common to said at least two three-dimensional models *([0021], "The present invention will be illustrated below in conjunction with exemplary processing techniques applied <u>to three-dimensional surface data in the form of meshes</u> of triangles ... A 'remesh' is a mesh which is generated <u>from a base domain mesh</u> using a parameterization" where a domain mesh is a basic model and [0029], "The resulting consistent parameterizations give immediate point correspondences between the meshes and allow the meshes to be remeshed with the same connectivity, i.e., to be remeshed such that <u>every vertex in one remesh has a unique corresponding vertex in every other remesh</u>").*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the base model and common vertices as taught by Praun with the teachings of Galpin. The motivation of claim 1 is incorporated herein.

As per claim 3, Galpin does not explicitly teach the claimed limitations.

Praun teaches the claimed:

3. Method for representing according to claim 2, wherein the passage from one of said three-dimensional models to another is done by wavelet transformation, using a first set of wavelet coefficients *([0012], "including, for example, principle mesh components analysis, <u>transfer of textures or wavelet details between meshes</u>, and shape blending").*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the wavelets between models as taught by Praun with the teachings of Galpin in order to take advantage of known mesh DGP algorithms ([0026] of Praun).

As per claim 4, Galpin does not explicitly teach the claimed limitations.

Praun teaches the claimed:

4. Method for representing according to claim 3, wherein one of said three-dimensional models is obtained from said associated basic model by wavelet transformation, using a second set of wavelet coefficients *([0086], "A further application involves the transfer of wavelet details from one mesh to another. To illustrate this idea we combine the base domain of one mesh with <u>the wavelet coefficients from another mesh</u>" where in figure 2 a first of one of the models is being*

transformed is the use a first set of wavelet coefficients and a second of one of the models is being transformed is the use a second set of wavelet coefficients).

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the wavelets as taught by Praun with the teachings of Galpin. The motivation of claim 3 is incorporated herein.

As per claim 5, Galpin teaches the claimed:

5. Method for representing according to claim 1, wherein said irregular mesh of level n is a two-dimensional irregular mesh of one of the pictures of said GOP of level n *(in figure 1 where "Keyframe 0" is a two-dimensional irregular mesh of a picture "Image 0". The GOP level n in figure 1 is "GOP 0").*

As per claim 6, Galpin teaches the claimed:

6. Method for representing according to claim 5, wherein said meshed picture is the first picture of said GOP of level n *(in figure 1 where "Keyframe 0" is a meshed picture. The GOP level n in figure 1 is "GOP 0").*

As per claim 7, Galpin teaches the claimed:

7. Method for representing according to claim 1, wherein each of said three-dimensional models is obtained by elevation of said irregular mesh representing it *(in figure 1 where the vertices represent the depth of the object surface, i.e. the teapot. This depth of the surface is a measure*

of elevation; this is similar to the definition of elevation given at the top of page 16 in specification).

As per claim 8, Galpin does not explicitly teach the claimed limitations.

Praun teaches the claimed:

8. Method for representing according to claim 5, wherein said irregular two-dimensional mesh is obtained by successive simplifications of a regular triangular mesh of said picture *(Praun: [0037], "For concreteness, we will further assume that such remeshes are built by <u>repeated triangle quadrisection</u> starting from a coarse irregular mesh N.sub.0=(Q.sub.0, L.sub.0) with the finer meshes denoted N.sub.j=(Q.sub.j, L.sub.j) ... regular refinement procedures" where refinement procedures are successive simplifications).*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate refinement procedures as taught by Praun with the teachings of Galpin in order to efficiently build meshes with fine details.

As per claim 10, Galpin teaches the claimed:

10. Method for representing according to claim 1, wherein two successive GOPs have at least one common picture *(in figure 1 where "GOP 0" and "GOP 1" have frame "Keyframe 1" in common).*

As per claims 11 and 12, Galpin does not explicitly teach the claimed limitations.

Galpin suggests the claimed:

11. Method for representing according to claim 1, wherein said vertices common to said levels n-1 and n are detected by estimation of motion between the first picture of said GOP of level n-1 and the first picture of said GOP of level n *(Galpin: in figure 2 at the top left, "Motion estimation" and the first paragraph under section 4.1.2, "We also compute a set of matched points E between current images I and I' using the motion field". Praun teaches of common vertices in [0011]).*

12. Method for representing according to claim 11, wherein it includes storing said detected common vertices *(Galpin: first paragraph under section 4.1.2 "These points are chosen among the vertices of the mesh used in motion estimation" where the vertices would have to be stored in memory to be used by the software).*

In regards to claims 11 and 12, it would have been obvious to one of ordinary skill in the art at the time of invention to generate common vertices using motion estimation based on the teachings of Galpin. Galpin is modified by applying their motion estimation to determined vertices correspondence between 3D models. When combined with Praun, such common vertices can then be later applied to corresponding models such as those shown in figure 2 of Praun. One advantage to finding common vertices is to achieve consistent parameterizations between the models in the GOPs.

As per claim 13, Galpin does not explicitly teach all the claimed limitations.

The combination of Galpin and Praun teaches the claimed:

13. Method for representing according to claim 1, wherein said irregular mesh representing said model associated with the GOP of level n also takes account of at least one vertex of at least the

irregular mesh representing the model associated with the GOP of level n+1 *(Galpin shows GOP level n and level n+1 in figure 1 with "GOP 0" and "GOP 1". Praun teaches of one vertex of an irregular mesh: [0011], "generating consistent parameterizations for a set of meshes, e.g., irregular connectivity meshes representing surfaces of arbitrary topology" and in figure 2 where a model is shown. In this case in figure 2, model 102-1, 102-2, and 102-3 each have common vertices associated with each model. Also see [0029], "The resulting consistent parameterizations give immediate point correspondences between the meshes and allow the meshes to be remeshed with the same connectivity, i.e., to be remeshed such that every vertex in one remesh has a unique corresponding vertex in every other remesh". When these common vertices are applied to the teapot models in figure 1 of Galpin the claimed limitations are taught by the combination of references).*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate common vertices as taught by Praun with the GOPs of Galpin in order to provide a common parameterizations between the models used in Galpin *(i.e. in Praun [0012], "By providing consistent parameterizations for a set of meshes, the invention greatly facilitates mesh processing operations in a wide variety of DGP applications, including, for example, principle mesh components analysis, transfer of textures or wavelet details between meshes, and shape blending").*

As per claim 17, the reasons and rationale for the rejection of claims 1-3 are incorporated herein. Galpin teaches the claimed:

one camera position parameter *(in the abstract, "automatically extract the set of 3D models and associate camera positions").*

As per claim 18, Galpin teaches the claimed:

18. A device for representing a sequence of pictures implementing the representation method of claim 1 *(in figure 1 where a sequence of pictures is shown at the top).*

As per claim 19, this claim is similar in scope to claims 1, 3, and 17, and thus is rejected under the same rationale.

As per claim 20, the reasons and rationale for the rejection of claim 1 is incorporated herein. Galpin teaches the claimed:

encoding *(in the abstract, "We propose an automatic way to encode such video sequences using several 3D models").*

As per claim 21, this claim is similar in scope to claims 1 and 20, and thus is rejected under the same rationale.

2. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Galpin (NPL Doc, "Sliding Adjustment for 3D Video Representation") in view of Praun et al. (US Pub 2002/0143419) in further view of Barrus et al. (US Patent 6,975,334).

As per claim 9, Galpin does not explicitly teach the claimed limitations.

Barrus teaches the claimed:

9. Method for representing according to claim 5, wherein said irregular two-dimensional mesh is obtained from a Delaunay mesh of predetermined points of interest of said picture *(col 5, lines 25-28 "an enclosing region that has been divided up into a Delaunay triangulation using the marker knee points as vertices". Predetermined points of interest are points on the surface).*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Galpin, Praun, and Barrus in order to generate surfaces from images (abstract of Barrus). Galpin and Praun are modified by Barrus by incorporating the surface determination capabilities of Barrus into the 3D model generation in Galpin.

2. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Galpin (NPL Doc, "Sliding Adjustment for 3D Video Representation") in view of Praun et al. (US Pub 2002/0143419) in further view of Schroeder et al. (US Patent 6,995,761).

As per claim 14, Galpin does not explicitly teach the claimed limitations.

Schroeder teaches the claimed:

14. Method for representing according to claim 4, wherein said second set of wavelet coefficients is generated by the application of at least one analysis filter on a semi-regular re-meshing of said associated three-dimensional model *(col 5, lines 23-25, "The choice of Loop subdivision fixes the*

low pass *reconstruction filter P in a wavelet construction* *with a high pass reconstruction filter Q").*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Galpin, Praun, and Schroeder in order to utilize effective and well-proven wavelet transformation techniques. Galpin and Praun are modified by Schroeder by incorporating the wavelet transformation used in Schroeder into the wavelet transformations performed in Schroeder.

2. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Galpin (NPL Doc, "Sliding Adjustment for 3D Video Representation") in view of Praun et al. (US Pub 2002/0143419) in further view of Kolarov et al. (US Patent 6,144,773).

As per claim 15, Galpin does not explicitly teach the claimed limitations.

Kolarov teaches the claimed:

15. Method for representing according to any of the claim 3, wherein said wavelets are second-generation wavelets *(in the abstract, "Second generation wavelets for the function are calculated using a triangular subdivision scheme").*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Galpin, Praun, and Kolarov in order to utilize effective and well-proven wavelet transformation techniques. Galpin and Praun are modified by Kolarov by incorporating the second-generation wavelet coefficients used in Kolarov into the wavelet coefficients in Schroeder.

2. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Galpin (NPL Doc, "Sliding Adjustment for 3D Video Representation") in view of Praun et al. (US Pub 2002/0143419) in further view of Schroeder et al. (US Patent 6,995,761) in further view of Kolarov et al. (US Patent 6,144,773).

As per claim 16, Galpin does not explicitly teach the claimed limitations.

Schroeder teaches the claimed:

16. Method for representing according to any of the claim 3, wherein said wavelets belong to the group comprising: piecewise affine wavelets; and wavelets based on the Butterfly subdivision scheme *(col 4, lines 55-58, "The distance between the input mesh T and a much finer mesh S obtained by <u>Butterfly subdividing T may be used</u> for this purpose"; col 4, lines 66-67, "Neighboring vertices of these <u>piecewise smooth models</u>, can be highly correlated"; col 4, lines 63-66, "The <u>wavelet transform</u> of 415 replaces the original mesh with a coarsest mesh and a sequence of wavelet coefficients expressing the difference between successive more detailed levels").*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the wavelets as taught by Schroeder with the teachings of Galpin and Praun. The motivation of claim 14 is incorporated herein.

Kolarov teaches the claimed:

polynomial wavelets *(col 5, lines 45-50, "For each of the geometric base types, the calculation of second generation wavelets may use any of a linear, quadratic, cubic or butterfly lifting scheme")*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the wavelets using polynomials as taught by Kolarov with the teachings of Galpin, Praun, and Schroeder in order to expand the total available types of surfaces for mesh generation with wavelets.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: see form 892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ulka Chauhan/
Supervisory Patent Examiner, Art Unit 2628

/Daniel Hajnik/

DFH